

What is claimed is:

1 1. A method for wireless communication, comprising:  
2 determining a first downlink transmission beam and a second downlink  
3 transmission beam based on a received user-derived signal, the first downlink transmission  
4 beam being substantially uncorrelated with the second downlink transmission beam, the  
5 first downlink transmission beam being associated with a portion within a first sector, the  
6 second downlink transmission beam being associated with a portion within a second  
7 sector;  
8 diversity encoding a first signal to produce a first diversity-encoded signal;  
9 diversity encoding a second signal to produce a second diversity-encoded signal;  
10 sending the first diversity-encoded signal over the first downlink transmission  
11 beam; and  
12 sending the second diversity-encoded signal over the second downlink  
13 transmission beam.

1 2. The method of claim 1, wherein:  
2 the first signal and the second signal are diversity encoded so that an associated  
3 decoder error rate is less than a decoder error rate for one diversity-encoded signal.

1 3. The method of claim 1, wherein the first sector substantially corresponds to the  
2 second sector.

1 4. The method of claim 1, wherein the first sector differs from the second sector.

1 5. The method of claim 1, wherein:  
2 the received user-derived signal includes a first component and a second  
3 component, the first component of the received user-derived signal being received on a  
4 first antenna array, the second component of the received user-derived signal being  
5 received on a second antenna array, the first antenna array differs from the second antenna  
6 array.

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1    6.    The method of claim 1, wherein:

2            the received user-derived signal includes a first component and a second  
3            component, the first component of the received user-derived signal being received on a  
4            first antenna array, the second component of the received user-derived signal being  
5            received on a second antenna array, the first antenna array substantially corresponds to the  
6            second antenna array.

1    7.    The method of claim 1, wherein:

2            the first downlink transmission beam is associated with a first polarization, the  
3            second downlink transmission beam is associated with a second polarization substantially  
4            orthogonal to the first polarization.

1    8.    The method of claim 7, wherein:

2            the first sector substantially corresponds to the second sector, and  
3            the portion within the first sector substantially corresponds to the portion within  
4            the second sector.

1    9.    The method of claim 7, wherein:

2            the portion within the first sector differs from the portion within the second sector.

1    10.   The method of claim 1, wherein:

2            the portion within the first sector overlaps, at least partially, with the portion within  
3            the second sector.

1    11.   The method of claim 1, wherein:

2            the first downlink transmission beam is sent from a first antenna array, and  
3            the second downlink transmission beam is sent from a second antenna array.

1    12.   The method of claim 1, wherein:

2            the first downlink transmission beam is sent during a first time period, and  
3            the second downlink transmission beam is sent during a second time period that  
4            overlaps, at least partially, with the first time period.

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1 13. The method of claim 1, wherein:

2 the first downlink transmission beam is associated with a first frequency range, the  
3 second downlink transmission beam is associated with a second frequency range at least a  
4 portion of which is different from the first frequency range.

1 14. The method of claim 1, wherein:

2 the first downlink transmission beam is associated with a first uplink multipath  
3 from a plurality of uplink multipaths associated with a first user, the second downlink  
4 transmission beam is associated with a second uplink multipath from the plurality of  
5 uplink multipaths, the first uplink multipath and the second uplink multipath being no less  
6 optimal than the remaining uplink multipaths from the plurality of uplink multipaths.

1 15. The method of claim 1, wherein the diversity encoding further includes:

2 multiplexing a first pilot signal and an information signal to produce a first  
3 multiplexed signal;

4 spreading and scrambling the first multiplexed signal to produce a first  
5 spread/scrambled signal; and

6 modifying the first spread/scrambled signal based on a first feedback signal.

1 16. The method of claim 15, wherein the diversity encoding further includes:

2 multiplexing a second pilot signal and the information signal to produce a second  
3 multiplexed signal;

4 spreading and scrambling the second multiplexed signal to produce a second  
5 spread/scrambled signal; and

6 modifying the second spread/scrambled signal based on a second feedback signal.

1 17. The method of claim 1, wherein the determining includes:

2 identifying a first multipath component and a second multipath component of the  
3 received user-derived signal for a first user, the first multipath component and the second  
4 multipath component being no less optimal than remaining multipath components of the  
5 received user-derived signal for the first user;

6 identifying a first angular arrival range and a second angular arrival range based on  
7 the first multipath component and the second multipath component, respectively; and  
8 defining the first downlink transmission beam and the second downlink  
9 transmission beam based on the first angular arrival range and the second angular arrival  
10 range.

1 18. The method of claim 1, wherein the first signal and the second signal are  
2 diversity encoded based on the received user-derived signal.

1 19. The method of claim 1, wherein the first signal and the second signal are  
2 diversity encoded based on at least one characteristic of the received user-derived signal  
3 from the group of: a signal quality, a data rate, a signal strength, and a signal cross-  
4 correlation property.

1 20. The method of claim 1, wherein:  
2 the received user-derived signal includes a first component and a second  
3 component, the first component of the received user-derived signal being associated with  
4 its own multipath, the second component of the received user-derived signal being  
5 associated with its own multipath;

6 the diversity encoding the first signal includes:  
7 determining a complex gain associated with the first diversity signal based  
8 on feedback information associated with the first component of the received user-  
9 derived signal; and

10 the diversity encoding the second signal includes:  
11 determining a complex gain associated with the second diversity signal  
12 based on feedback information associated with the second component of the  
13 received user-derived signal.

1 21. The method of claim 1, wherein the first diversity-encoded signal is associated  
2 with its own diversity code, the second diversity-encoded signal is associated with its own  
3 diversity code that is separable from the diversity code associated with the first diversity-  
4 encoded signal.

1 22. A method for wireless communication for a first user, comprising:  
2 receiving a first diversity-encoded signal from a first downlink transmission beam;  
3 and  
4 receiving a second diversity-encoded signal from a second downlink transmission  
5 beam, the first downlink transmission beam being substantially uncorrelated with the  
6 second downlink transmission beam, the first downlink transmission beam being  
7 associated with a portion of a first sector, the second downlink transmission beam being  
8 associated with a portion of a second sector.

1 23. The method of claim 22, further comprising:  
2 sending a user-derived signal,  
3 the portion within the first sector being based on a first component of a received  
4 user-derived signal, the first component of the received user-derived signal being  
5 associated with a first multipath, and  
6 the portion within the second sector being based on a second component of the  
7 received user-derived signal, the second component of the received user-derived signal  
8 being associated with a second multipath.

1 24. The method of claim 22, wherein:  
2 the first downlink transmission beam is associated with a first polarization, the  
3 second downlink transmission beam is associated with a second polarization substantially  
4 orthogonal to the first polarization.

1 25. The method of claim 24, wherein:  
2 the first sector substantially corresponds to the second sector, and  
3 the portion within the first sector substantially corresponds to the portion within  
4 the second sector.

1 26. The method of claim 22, wherein:  
2 the portion within the first sector differs from the portion within the second sector.

1 27. The method of claim 22, wherein:  
2 the portion within the first sector overlaps, at least partially, with the portion within  
3 the second sector.

1 28. The method of claim 22, wherein:  
2 the first downlink transmission beam is sent from a first antenna array, and  
3 the second downlink transmission beam is sent from a second antenna array.

1 29. The method of claim 22, wherein:  
2 the first downlink transmission beam is sent during a first time period, and  
3 the second downlink transmission beam is sent during a second time period that  
4 overlaps, at least partially, with the first time period.

1 30. The method of claim 22, wherein:  
2 the first downlink transmission beam is associated with a first frequency range, the  
3 second downlink transmission beam is associated with a second frequency range at least a  
4 portion of which is different from the first frequency range.

1 31. The method of claim 22, wherein:  
2 the first downlink transmission beam is associated with a first uplink multipath  
3 from a plurality of uplink multipaths associated with the first user, the second downlink  
4 transmission beam is associated with a second uplink multipath from the plurality of  
5 uplink multipaths, the first uplink multipath and the second uplink multipath being no less  
6 optimal than the remaining uplink multipaths from the plurality of uplink multipaths.

1 32. The method of claim 22, wherein the first diversity-encoded signal and the  
2 second diversity-encoded signal have been diversity encoded based on a previous user-  
3 derived signal from the first user.

1 33. The method of claim 22, wherein the first diversity-encoded signal and the  
2 second diversity-encoded signal have been diversity encoded based on at least one  
3 characteristic of a previous user-derived signal from the group of: a signal quality, a data  
4 rate, a signal strength, and a signal cross-correlation property.

1 34. The method of claim 22, further comprising:

2 sending an uplink signal, a first component of the uplink signal being associated  
3 with its own multipath, a second component of the uplink signal being associated with its  
4 own multipath;

5 the first diversity-encoded signal having its own complex gain based on feedback  
6 information associated with the first component of the uplink signal; and

7 the second diversity-encoded signal having its own complex gain based on  
8 feedback information associated with the second component of the uplink signal.

1 35. The method of claim 22, wherein the first diversity-encoded signal is associated  
2 with its own diversity code, the second diversity-encoded signal is associated with its own  
3 diversity code that is separable from the diversity code associated with the first diversity-  
4 encoded signal.

1 36. An apparatus, comprising:

2 a searcher, the searcher being configured to identify a received user-derived signal;  
3 a beam controller coupled to the searcher;  
4 a first transmit beam switch coupled to the beam controller;  
5 a second transmit beam switch coupled to the beam controller;  
6 a diversity coder coupled to the first transmit beam switch and the second transmit  
7 beam switch, the diversity coder configured to send a first diversity encoded signal to the  
8 first transmit beam switch based on the received user-derived signal and to send a second  
9 diversity encoded signal to the second transmit beam switch based on the received user-  
10 derived signal; and

11 an antenna array coupled to the first transmit beam switch and the second  
12 transmit beam switch, the antenna array configured to define a first downlink transmission  
13 beam and a second downlink transmission beam, the first downlink transmission beam  
14 being associated with a portion within a first sector, the second downlink transmission  
15 beam being associated with a portion within a second sector, the first downlink  
16 transmission beam being substantially uncorrelated to the second downlink transmission  
17 beam, the first downlink transmission beam being associated with the first diversity-

18     encoded signal, the second downlink transmission beam being associated with the second  
19     diversity-encoded signal.

1     37.     The apparatus of claim 36, wherein the first sector substantially corresponds to  
2     the second sector.

1     38.     The apparatus of claim 36, wherein the first sector differs from the second sector.

1     39.     The apparatus of claim 36, wherein the diversity coder includes:  
2             a first multiplexer configured to receive a first pilot signal and an information  
3             signal to produce a multiplexed signal;  
4             a first spread/scramble module coupled to the first multiplexer, the first  
5             spread/scramble module configured to receive the multiplexed signal associated with the  
6             first multiplexer, the first spread/scramble module configured to produce a  
7             spread/scrambled signal; and  
8             a first complex-gain multiplier coupled to the first spread/scramble module, the  
9             first complex-gain multiplier configured to receive the spread/scrambled signal associated  
10            with the first spread/scramble module and a first feedback signal.

1     40.     The apparatus of claim 39, wherein the diversity coder further includes:  
2             a second multiplexer configured to receive a second pilot signal and the  
3             information signal to produce a multiplexed signal;  
4             a second spread/scramble module coupled to the second mutliplexer, the second  
5             spread/scramble module configured to receive the multiplexed signal associated with the  
6             second multiplexer, the second spread/scramble module configured to produce a  
7             spread/scrambled signal; and  
8             a second complex-gain multiplier coupled to the second spread/scramble module,  
9             the second complex-gain multiplier configured to receive the spread/scrambled signal  
10            associated with the second spread/scramble module and a second feedback signal.

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1 41. The apparatus of claim 36, wherein the diversity coder further includes:  
2       a space-time coder configured to receive an information signal and configured to  
3 send a first space-time coded signal and a second space-time coded signal, the first space-  
4 time coded signal being orthogonal to the second space-time coded signal;  
5       a first spread/scramble module configured to receive the information signal and  
6 configured to send a spread/scrambled signal; and  
7       a second spread/scramble module configured to receive the space-time coded  
8 signal and configured to send a spread/scrambled signal.

1 42. The apparatus of claim 36, wherein:  
2       the searcher is configured to receive the received user-derived signal including a  
3 first component and a second component,  
4       the antenna array includes a first portion and a second portion, the first component  
5 of the received user-derived signal being received from a first user-derived reception beam  
6 on the first portion of the antenna array, the second component of the received user-  
7 derived signal being received from a second user-derived reception beam on the second  
8 portion of the antenna array, the first user-derived reception beam differs from the second  
9 user-derived reception beam, the first portion of the antenna array differs from the second  
10 portion of the antenna array.

1 43. The apparatus of claim 36 wherein:  
2       the searcher is configured to receive the received user-derived signal including a  
3 first component and a second component,  
4       the antenna array includes a first portion and a second portion, the first component  
5 of the received user-derived signal being received from a first user-derived reception beam  
6 on the first portion of the antenna array, the second component of the received user-  
7 derived signal being received from a second user-derived reception beam on the second  
8 portion of the antenna array, the first user-derived reception beam substantially  
9 corresponds to the second user-derived reception beam, the first portion of the antenna  
10 array substantially corresponds to the second portion of the antenna array.

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1 44. The apparatus of claim 36, wherein:

2 the first downlink transmission beam is associated with a first polarization, the  
3 second downlink transmission beam is associated with a second polarization substantially  
4 orthogonal to the first polarization.

1 45. The apparatus of claim 44, wherein:

2 the first sector substantially corresponds to the second sector, and

3 the portion within the first sector substantially corresponds to the portion within  
4 the second sector.

## 4 the second sector.

1 46. The apparatus of claim 36, wherein:

2 the portion within the sector associated with the first downlink transmission beam  
3 differs from the portion within the sector associated with second downlink transmission  
4 beam.

1 47. The apparatus of claim 36, wherein:

2 the portion within the sector associated with the first downlink transmission beam  
3 overlaps, at least partially, with the portion within the sector associated with second  
4 downlink transmission beam.

1 48. The apparatus of claim 36, wherein:

2 the antenna array includes a first portion and a second portion,

3 the first downlink transmission beam is sent from the first portion of the antenna  
4 array, and

5 the second downlink transmission beam is sent from the second portion of the  
6 antenna array.

1 49. The apparatus of claim 36, wherein:

2 the first downlink transmission beam is sent during a first time period, and the  
3 second downlink transmission beam is sent during a second time period that overlaps, at  
4 least partially, with the first time period

1 50. The apparatus of claim 36, wherein:

2 the first downlink transmission beam is associated with a first frequency range, the  
3 second downlink transmission beam is associated with a second frequency range at least a  
4 portion of which is different from the first frequency range.

1 51. The apparatus of claim 36, wherein:

2 the first downlink transmission beam is associated with a first uplink multipath  
3 from a plurality of uplink multipaths associated with a first user, the second downlink  
4 transmission beam is associated with a second uplink multipath from the plurality of  
5 uplink multipaths, the first uplink multipath and the second uplink multipath being no less  
6 optimal than the remaining uplink multipaths from the plurality of uplink multipaths.

1 52. The apparatus of claim 36, wherein:

2 the searcher is configured to identify a first multipath component and a second  
3 multipath component of the received user-derived signal for a first user, the first multipath  
4 component and the second multipath component being no less optimal than remaining  
5 multipath components of the received user-derived signal for the first user; and

6 the beam controller being configured to define the first downlink transmission  
7 beam and the second downlink transmission beam based on the first angular arrival range  
8 and the second angular arrival range.

1 53. The apparatus of claim 36, wherein the diversity coder is configured to encode a  
2 first signal and a second signal based on a received user-derived signal to produce the first  
3 diversity-encoded signal and the second diversity-encoded signal.

1 54. The apparatus of claim 36, wherein the diversity coder is configured to encode a  
2 first signal and a second signal based on at least one characteristic of the received user-  
3 derived signal from the group of:

4 a signal quality, a data rate, a signal strength and a signal cross-correlation  
5 property,  
6 to produce the first diversity-encoded signal and the second diversity-encoded signal.

1 55. The apparatus of claim 36, wherein:

the searcher is configured to receive the received user-derived signal, the received user-derived signal includes a first component and a second component, the first component of the received user-derived signal is associated with its own multipath, the second component of the received user-derived signal being associated with its own multipath;

7 the diversity coder is configured to:

8 determine a complex gain associated with the first diversity signal based on  
9 feedback information associated with the first component of the received user-  
10 derived signal; and

11 determine a complex gain associated with the second diversity signal based  
12 on feedback information associated with the second component of the received  
13 user derived signal.

1 56. The apparatus of claim 36, wherein the first diversity-encoded signal is  
2 associated with its own diversity code, the second diversity-encoded signal is associated  
3 with its own diversity code that is separable from the diversity code associated with the  
4 first diversity encoded signal.

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